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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/624,716	07/25/2000	Gi-Joon Nam	X-633 US	6806

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EXAMINER

KIANERSI, MITRA

ART UNIT

PAPER NUMBER

2143

DATE MAILED: 09/10/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/624,716

Applicant(s)

NAM ET AL.

Examiner

mitra kianersi

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☐ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claims 1-21 have been examined.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 4-19, and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by R.Glenn Wood et al. [IEEE Transaction on Very Large Scale Integration (VLSI) System, Vol. 6, No. 2, June 1998].

1. As per claim 1, Wood et al. teach a routing and routability estimation method corresponding to determining routing feasibility of a plurality of nets, each net having an associated set of one or more routing solutions, each solution using one or more routing resources, (abstract, lines 4-6),
generating a first Boolean function with variables representing respective net/solution pairs, wherein the first function evaluates to true if there exists a set of values for the variables such that at least one of the variables for each net is logically true; (Pg 223, part II, lines 8-12) and (Pg 224, section 3).

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generating a second Boolean function using the variables that represent the net/solution pairs, wherein the second function evaluates to true if there exists at least one set of values for the variables such that no resource is used by more than a predetermined number of nets; (Pg 223, part II, lines 12-15), and

outputting a signal indicating whether there exists at least one set of values for the variables for which the first function and the second function evaluate to true (Pg 223, Col 1, lines 15-19 and line 25).

2. A per claim 4, Wood et al. teach a method, wherein the resources comprise signal routing resources of a field programmable gate array (Pg 222, Col 1, Parag 2).

3. As per claim 5, Wood et al. teach a method, corresponding to generating a net table including respective sets of solutions associated with the nets (Pg 225, Col 1, Parag 2, lines 2-5).

4. As per claim 6, Wood et al. teach a method corresponding to generating the first function from the net table (Pg 225, Col 1, Parag 3).

5. As per claim 7, Wood et al. teach a method, corresponding to generating a resource table including respective sets of net/solution pairs associated with the resources, wherein each net/solution pair associated with a resource represents usage of the resource by the net/solution pair (Pg 224, Col 1, part 3).

6. As per claim 8, Wood et al. teach a method, corresponding to generating the second function from the resource table (Pg 225, Col 4).

7. As per claim 9, Wood et al. teach a method wherein the predetermined number of nets that can use a resource is 1 (Pg 224, Col 1, Part 3).

8. As per claim 10, Wood et al. teach a method corresponding to saving as a routing solution the at least one set of values for the variables for which the first function and the second function evaluate to true. (Pg 225, Col 1, Part 2, lines 8-11).

9. As per claim 11, Wood et al. teach a method corresponding to wherein if there exists no set values for the variables for which first and second functions evaluate to true, then performing the steps of: modifying one or more selected sets of the routing solutions; and repeating the steps of generating first and second functions and outputting the signal. (Pg 223, Col 1, Parag 4, lines 5-8).

10. As per claim 12, Wood et al. teach a method adding additional sets of routing solutions. (Pg 223, Col 1, lines 9-11)

11. As per claim 13, Wood et al teach a method wherein the repeating steps continue until predetermined criteria are met. (Pg 223, Col 1, Par 4, lines 8-10).

12. As per independent claim 14, Wood et al. teach an apparatus for determining routing feasibility of a plurality of nets, each net having an associated set of one or more routing solutions, each solution using one or more routing resources, comprising: (abstract, lines 4-6),
generating a first Boolean function with variables representing respective net/solution pairs, wherein the first function evaluates to true if there exists a set of values for the variables such that at least one of the variables for each net is logically true; (Pg 223, part II, lines 8-12) and (Pg 224, section 3)

generating a second Boolean function using the variables that represent the net/solution pairs, wherein the second function evaluates to true if there exists at least one set of values for the variables such that no resource is used by more than a predetermined number of nets; (Pg 223, part II, lines 12-15)

outputting a signal indicating, whether there exists at least one set of values for the variables for which the first function and the second function evaluate to true (Pg 223, Col 1, lines 15-19 and line 25).

13. As per independent claim 15, Wood et al. teach a computer-implemented method corresponding to determining routing feasibility of a plurality of nets sharing a-plurality of resources, comprising: (Pg 225, Col 2, Parag 2, lines 3-6),

inputting respective sets of one or more solutions associated with the plurality of nets, each solution being associated with one or more required resources, (Pg 222, Col 2, Parag 3, lines 2-11) and (Pg 225, Col 2, Parag 2),

assigning respective identifiers to net/solution pairs; generating respective Boolean liveness functions for the nets using the net/solution pairs; (Pg 223, Col 2, Par 3),

generating respective Boolean exclusivity functions using the net/solution pairs for each resource required by two or more nets; (Pg 224, Col 1, Par 4),

generating a routability Boolean function as a logical AND of the liveness functions and exclusivity functions; and testing whether the routability function can be satisfied. (Pg 226, Col 1, Parag 4, lines 8-11).

14. As per claim 16, Wood et al. teach a method corresponding to generating a net table including respective sets of solutions associated with the nets. (pg 225, Col 1, Part II, lines 2-5).

15. As per claim 17, Wood et al. teach a method corresponding to generating a liveness functions from the net table. (Pg 225, Col 1, Parag 3).

16. As per claim 18, Wood et al. teach a method corresponding to the method of generating a resource table including respective sets of net/solution pairs associated with the resources, wherein each net/solution pair associated with a resource represents usage of the resource by the net/solution pair. (PG 224, Col 1, Part 3)

17. As per claim 19, Wood et al. teach a method corresponding to the generating the exclusivity functions from the resource table. (Pg 224, part 4)

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18. As per claim 21, Wood et al. teach a method corresponding to applying Boolean satisfiability to the routability function. (Pg 224, part 5)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 2-3, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Abramovici et al. (US 6,442,732).

As per claims 2-3, and 20, Wood et al. do not teach the Boolean and Exclusivity functions and also the routability function in conjunctive normal form (CNF), however, Abramovici et al. teaches a method corresponding to representing the first and second Boolean function in conjunctive normal form (Pg 1, lines 19-21), applying Boolean satisfiability to first and second function (Pg 1, lines 15-18), and Representing the liveness and exclusivity functions and the routability function in conjunctive normal form (Pg 2, lines 60-67).

One of ordinary skill in the art would have been motivated to use the product-of-sum, which is also called conjunctive normal form (CNF), because doing so would have allowed a reconfigurable hardware platform to process circuits much larger than the available capacity of the platform at the cost of a limited amount of additional processing time. (Pg 3, lines 22-25)

Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to recognize that conjunctive normal form (CNF)

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could be used in satisfiability algorithms for computational aspects of the integrated circuits and other complex systems and devices.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mitra Kianersi whose telephone number is (703) 305-4650. The examiner can normally be reached on 7:00AM-4:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wiley can be reached on (703) 308-5221. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

Mitra Kianersi

Aug 19,2003


DAVID WILEY
SUPERVISORY PATENT EXAMINER
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